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## ***FY 2000 Technology Deployment Titles***

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*WSRC High Level Waste Management Division*

*[Click on Title for Deployment Fact Sheet Information](#)*

***BIBO Pump***

***Diverter Valve***

***Flygt Mixers (3)***

***Gould Pump***

***Hydrolaser***

***Insertion Mast for Tank 18 Recycle System***

***Insertion Mast for Tank 19 Transfer System***

***Krohne Flow Meters***

***Pit Bull Pump***

***Super Sleever***

***Transfer Line Cleaning Tool***

***Transfer Line Connector***



## BIBO Pump

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19 Transfer System

**Deployment Date:** Aug 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1026  
**TMS ID Number:**

#### Technology Effectiveness

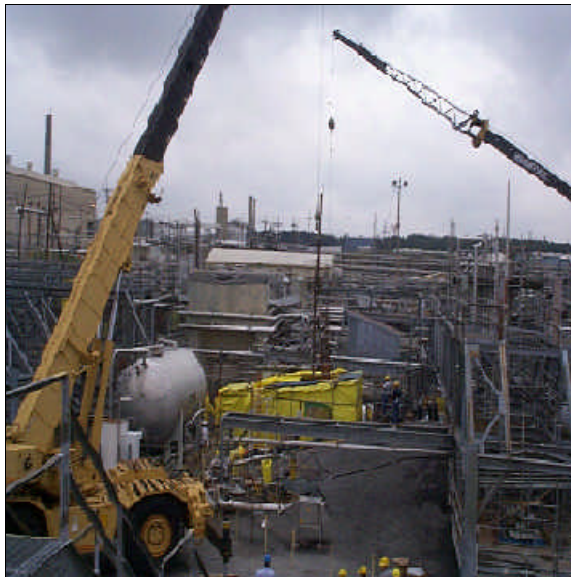
**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**



#### Original Problem:

Locate a suitable transfer pump that does not require being submerged for cooling purposes. Most transfer pumps require submerging to allow the pumped fluid to act as a cooling agent.

#### Technology Solution:

The BIBO is a centrifugal pump designed to transfer 200gpm at 125 feet of total head. The pump had to be capable of pumping solid particles less than 3/8" in diameter. It is required to pump thick, viscous and abrasive fluids with settling velocities greater than 3 feet per second.

#### Benefits:

Off the shelf commercially available, easily adaptable to a deployment mast, fits through the 22' riser opening.

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Date of Issue: March 2001



## *BIBO Pump*

Savannah River Site Technology Deployment

### *WSRC High Level Waste Management Division*

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## Diverter Valve

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 18 Recycle System

**Deployment Date:** Aug 2000

**Dept. of Energy** SRS1030

**TMS ID Number:**

**Is this a SRS Baseline Technology?:** No

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

Find a method to use an existing underground transfer line to move the slurry from Tank 19 to Tank 18 and utilize the same line to move the recycle supernate from Tank 18 to tank 19.

#### Technology Solution:

Develop a three way valve (without electrical or air operated actuators) that allowed sludge/slurry from tank 1 to be transferred into Tank 18 and, and the supernate material from Tank 18 to be recycled back into Tank 19, using the same transfer line.

#### Benefits:

Allows the use of only one transfer line and is operated by the force of the liquid moving through it not air or electrically operated actuators, reducing power and control cabling/tubing.



## *Diverter Valve*

Savannah River Site Technology Deployment

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Technology Number 39



## Flygt Mixers (3)

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19

**Deployment Date:** Jul 2000

**Dept. of Energy** 2232

**TMS ID Number:**

**Is this a SRS Baseline Technology?:** No

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**



#### Original Problem:

A need to improve the capability to mobilize and mix waste in storage tanks for transfer and removal. Before a high-level waste tank can be emptied and closed, the radioactive sludge on the tank bottom must be suspended in the liquid waste above. Long-shaft slurry pumps that agitate and suspend the sludge in the liquid are expensive, require extensive external support superstructures, and are subject to maintenance problems. To prepare the waste tank for these pumps costs from \$6 to \$10 million.

#### Technology Solution:

The Flygt Mixer is a submersible mixer technology to rapidly mix large quantities of tank waste. This mixing is necessary to prepare the waste for retrieval and transfer in support of subsequent treatment activities. The Flygt Mixer uses a propeller to move waste within the tank. The propeller is configured to create long-range currents capable of mixing over 20,000 gal/min of tank waste. A test program developed mixer sizing and configuration data along with recommended operating practices for use in full scale waste tanks. Flygt Mixers are less expensive, more effective, and require less maintenance than standard baseline mixer pumps.

15 HP mixers have been deployed for waste heel removal, and a new generation of 50 HP mixers has recently been tested for future deployments. The 50 HP mixers will fit through tank top openings as small as 22 inches, produce 1600 pounds of propulsion thrust, and are capable of mixing nearly 20,000 gallons per minute of tank waste.

#### Benefits:

Cost: Cost Benefits Expected

Risk: Expected to significantly Lower Risks

The Flygt mixer, similar to an outboard motor, sets up more long range currents in the tank. Compared to a conventional mixer, the Flygt mixer is small, works inside the tank (reducing the risk of worker exposure), and is less expensive.

Flygt mixers do a better job at 10 percent of the cost.

- Capital expenditures decrease dramatically: Flygt mixers cost \$40,000 each; long-shaft slurry pumps cost about \$400,000

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Date of Issue: March 2001

### *Flygt Mixers (3)*

# Savannah River Site Technology Deployment

*WSRC High Level Waste Management Division*

each.

- Deployment time is cut: Flygt mixers rest on the tank bottom and do not need an extensive support structure above the tank.
- Performance improves: Flygt mixers operate at 30,000 gpm using 50hp; slurry pumps operate at 1,200 gpm using 200 hp.

Provide waste tank agitation capability in support of tank cleaning and closure. Eliminate costly slurry pumps and associated support structures. Reduce waste generation due to small size and effectiveness of insitu mixer.

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## Gould Pump

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 18 Recycle System

**Deployment Date:** Aug 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1029  
**TMS ID Number:**

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

To reduce water volume addition to the tank farm, already short on storage space, it was decided to recycle the supernate from Tank 18 after the sludge had settled out of the slurry pumped from Tank 19.

#### Technology Solution:

The Goulds pump is an off the shelf , commercially available, centrifugal pump suspended in the supernate inside Tank 18. The supernate acted as the cooling agent for the pump alleviating the need to run a cooling water line to the pump during operation.

#### Benefits:

By using the supernate from Tank 18 as the mixing fluid for Tank 19 waste production was minimized during mixing operations.







## Hydrolaser

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19

**Deployment Date:** Dec 1999

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1036

**TMS ID Number:**

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

The sludge and zeolite in Tank 19 had combined over the years into large chunks that were not being broken up and mobilized by the Flygt Mixers.

#### Technology Solution:

Off the shelf high pressure nozzles (Approx. 25-30 gpm at 6000 psi) combined with a long lance handle were deployed through the Northeast riser of Tank 19 to successfully break up the large chunks and mobilize the material in the supernate.

#### Benefits:

Cost effective, off the shelf, no development costs/time





## Insertion Mast for Tank 18 Recycle System

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 18 Recycle System

**Deployment Date:** Aug 2000

**Dept. of Energy** SRS1028  
**TMS ID Number:**

**Is this a SRS Baseline Technology?:** No

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

Avoid top loading Tank 19 with the superstructure required to support the transfer mast with the BIBO, Pit Bull and associated piping. Due to limited access to Tank 19 both pumps were required to be deployed together through the same riser.

#### Technology Solution:

A beam pump mast was constructed that would allow the BIBO to be attached to the bottom of the mast and the Pit Bull to travel down the web of the beam on cam type rollers. The mast is lifted with BIBO attached and inserted through the riser opening, all hoses and the Krohne flow meter attached, the Pit Bull is then attached and lowered on its cam rollers.

#### Benefits:

Allowed both pumps to be deployed on one mast



## *Insertion Mast for Tank 18 Recycle System*

Savannah River Site Technology Deployment

### *WSRC High Level Waste Management Division*

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Technology Number 43



## Insertion Mast for Tank 19 Transfer System

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19 Transfer System

**Deployment Date:** Aug 2000

**Dept. of Energy** SRS1028

**TMS ID Number:**

**Is this a SRS Baseline Technology?:** No

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

Avoid top loading Tank 19 with the superstructure required to support the transfer mast with the BIBO, Pit Bull and associated piping. Due to limited access to Tank 19 both pumps were required to be deployed together through the same riser.

#### Technology Solution:

A beam pump mast was constructed that would allow the BIBO to be attached to the bottom of the mast and the Pit Bull to travel down the web of the beam on cam type rollers. The mast is lifted with BIBO attached and inserted through the riser opening, all hoses and the Krohne flow meter attached, the Pit Bull is then attached and lowered on its cam rollers.

#### Benefits:

Allowed both pumps to be deployed on one mast



## *Insertion Mast for Tank 19 Transfer System*

Savannah River Site Technology Deployment

### *WSRC High Level Waste Management Division*

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Technology Number 44



## Krohne Flow Meters

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19 Transfer System

**Deployment Date:** Aug 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1027  
**TMS ID Number:**

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

A picture is currently  
not available.

#### Original Problem:

Provide on line, real time density flow measurement of the transfer slurry prior to and during transfer to Tank 18.

#### Technology Solution:

The Krohne is a straight tube coriolis mass flow meter attached to the discharge line of the BIBO pump. The meter allows on line, real time specific gravity of the slurry being mixed in tank 19 to determine when the tank has been sufficiently mixed to initiate transfer to Tank 18. The meter can also be used to monitor on line specific gravity readings during the transfer. This data can be recorded in the control for later analysis.

#### Benefits:

Reduces transfers by allowing you to determine when the tank has been sufficiently mixed rather transferring on a predetermined schedule. Data collection for future analysis.







## Pit Bull Pump

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 19 Transfer System

**Deployment Date:** Aug 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1025  
**TMS ID Number:**

#### Technology Effectiveness

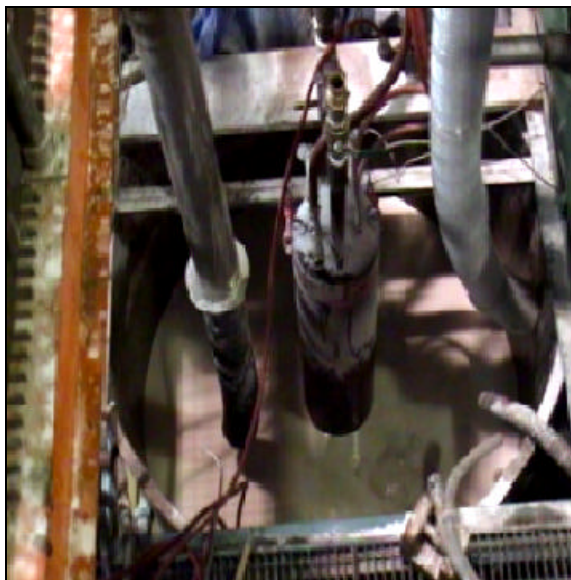
**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**



#### Original Problem:

Conventional centrifugal pumps cannot lower the tank level below six inches. Under these conditions the amount of waste left in the tank would exceed the maximum amount of waste allowable to remain in the tank for closure (approximately 1,000 gallons).

#### Technology Solution:

The Pit Bull pump has been designed to pump the liquid level in Tank 19 from 6" down to the «" level. The Pit Bull pump is a air style positive displacement pump, consisting of a pump chamber, two check valves, and an air pressure/vacuum control system. The pump removes waste by allowing the liquid to fill the pump through an inlet check valve , and then when full, it pressurizes with compressed air and forces the liquid out through the discharge check valve. The pump is equipped with a vacuum generator that will draw the waste into the chamber. The pump had to be capable of pumping solid particles less than 3/8" in diameter. It is required to pump thick, viscous and abrasive fluids with settling velocities greater than 3 feet per second.

#### Benefits:

Greatly reduces the amount of waste heel remaining in the tank.



## *Pit Bull Pump*

Savannah River Site Technology Deployment

### *WSRC High Level Waste Management Division*

#### *SRS Technology End User*

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## Super Sleever

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** H-Tank Farm

**Deployment Date:** Apr 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1024  
**TMS ID Number:**

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**



#### Original Problem:

SRS uses over 1.7 million feet of air hose per year in various operations requiring air-supplied suits and hoods for personnel protection. Most applications are one time use due to the inability to easily radiologically release the hose from the contaminated area for reuse. The hoses were disposed as LLW.

#### Technology Solution:

A SRS operator engineered a portable device that manually dispenses a plastic protective sheath, or sleeve, over long and comparatively narrow objects in less than a tenth of the time it takes to do the same work without the device. This device was marketed and licensed for manufacture to a commercial nuclear service company for deployment.

#### Benefits:

Site wide application would be to cover plastic suit, hood hoses, flush water hoses, and extension cords taken into Contamination Areas (CAs) and Airborne Radioactivity Areas (ARAs). Deployment of this device started in January 2000. It is expected to avoid 17,000 cubic feet of low level waste. Additional applications are being developed during field deployment.

- Technology licensed to a vendor which has already used at six commercial nuclear sites.
- Avoids 480 m3 of LLW annually from reuse of hoses, cables, and cords.
- Many new applications being recognized during field deployment.

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## *Super Sleever*

Savannah River Site Technology Deployment

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### *WSRC High Level Waste Management Division*

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## Transfer Line Cleaning Tool

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 18 Recycle System

**Deployment Date:** Jun 2000

**Is this a SRS Baseline Technology?:** No

**Dept. of Energy** SRS1031  
**TMS ID Number:**

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**



#### Original Problem:

A camera inspection of the Tank 18 west riser revealed the condition of the transfer line being flush with the wall. There was also some metal slag or concrete grout identified in the bottom of the transfer line extending into the pipe an inch or so. A line cleaning tool was required capable of remotely grinding the inside of the 3 inch transfer line to clear the debris and make a smooth surface to install the connector tool.

#### Technology Solution:

A camera inspection of the west riser revealed the condition of the transfer line being flush with the wall. There was also some metal slag or concrete grout identified in the bottom of the transfer line extending into the pipe an inch or so. The line cleaning tool was designed to remotely grind the inside of the 3 inch transfer line to clear the debris and make a smooth surface to install the connector tool. A high speed pneumatic drill, fitted with a single flat blade was deployed down the West riser to the transfer line pipe. The drill had a three pronged tightening ring in front of the drill blade. This ring was inserted approximately 6 inches into the transfer line and expanded. The tightening ring centered the drill with the center of the transfer pipe. The cutting blade could be advanced using a gear driven system on top of the riser (remotely). The cutting blade was advanced to cut away the debris in the transfer line and also approximately half of the transfer line pipe thickness. This created a clean, smooth transfer pipe to deploy the insert connector into.

#### Benefits:

Cost effective and better from a radcon perspective to use an existing underground transfer line.

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Date of Issue: March 2001



## *Transfer Line Cleaning Tool*

Savannah River Site Technology Deployment

### *WSRC High Level Waste Management Division*

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## Transfer Line Connector

Savannah River Site Technology Deployment

### WSRC High Level Waste Management Division

**SRS Location:** Tank 18 Recycle System

**Deployment Date:** May 2000

**Dept. of Energy** SRS1032

**TMS ID Number:**

**Is this a SRS Baseline Technology?:** No

#### Technology Effectiveness

**SRS Waste Stream:**

**Life-cycle Waste Stream Reduction:**

**Total Project Cost:**

**Life-cycle Savings:**

**Return on Investment:**

**A picture is currently  
not available.**

#### Original Problem:

The underground transfer line from Tank 19 to Tank 18 terminated in the West riser of Tank 18. At some point, the transfer line was cut off flush with the riser wall. Since there was no pipe extending into the riser to connect with the Tank 18 transfer line an insert connector was needed.

#### Technology Solution:

The transfer line connector tool was designed to be placed into the existing three inch transfer line at the west riser. The connector tool is approximately 12 inches long with a cam lock fitting on one end and a slightly tapered nose end. The insert connector has three flat rubber rings approximately one inch wide each. A specially designed deployment tool was used which had a mating cam-lock connector which held the insert connector in a vertical plane. The insert connector was lowered into the west riser and inserted approximately 6 inches into the transfer line. The deployment tool had gears that mated the threaded tightening ring on the insert connector. From the top of the riser, the gears could be turned and tightening ring would compress the three rubber rings. The rubber rings expanded against the transfer line and held the connector in place. The special deployment tool was then remotely removed from the insert connector and removed from the riser. The cam lock fitting on the end of the connector tool is now available to receive the transfer piping from the Tank 18 pumping system. The insert connector has been in service for four months with no leakage.

#### Benefits:

Cost effective and better from a radcon perspective to use an existing underground transfer line.



